CEREAL SCIENCE today

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AN OFFICIAL PUBLICATION
OF THE
AMERICAN ASSOCIATION
OF CEREAL CHEMISTS

OF INTEREST THIS MONTH

VITAMIN B_6 IN HUMAN NUTRITION
EVALUATION OF GRAIN FUMIGANTS
UNSATURATED FAT IN HUMAN NUTRITION

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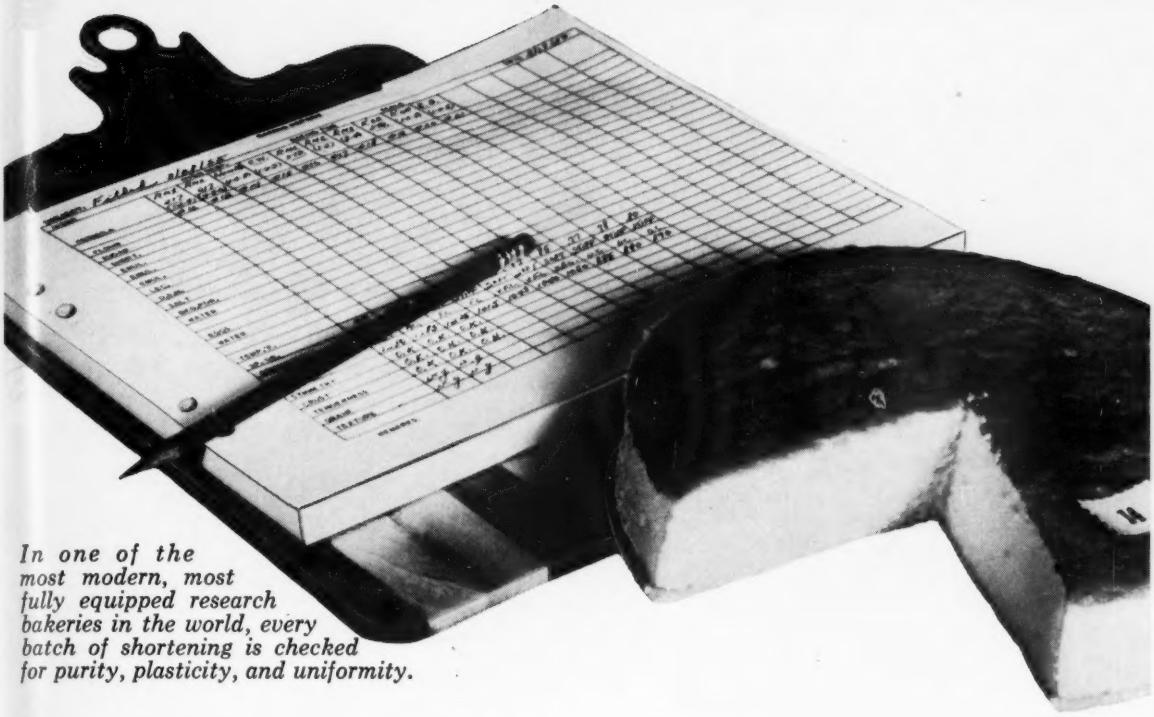

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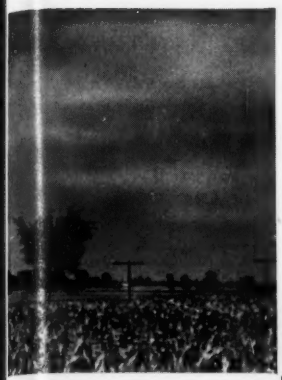

CEREAL SCIENCE today

FEATURES

DEPARTMENTS

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COVER: Enlarged view of wheat kernels. Photo courtesy of the Department of Plant Pathology, University of Minnesota, St. Paul.

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Editorial

THE NUMBER, MAGNITUDE, and quality of the decisions made by those responsible for the management of any enterprise largely determine its success. Sometimes a decision can be deferred until all information likely to affect it can be gathered and studied. Other decisions may have to be based on a pure guess. In between these extremes, most decisions are based on some previous experience, some gathering of existing data, some newly developed knowledge, or a combination of these. Complete information and proper quantification of conflicting data are the best requisites for decision.

Cereal chemists are likely to be very much involved in the decision-making process. It is expected that they will make numerous decisions concerning organization of their work, the manner of handling responsibilities delegated to them, reporting their findings, etc. Less obvious, but perhaps of even greater consequence, is the manner in which the information cereal chemists provide affect decisions made by others. It is a startling thought, but frequently a decision is not really made by the individual who thinks he makes it. It may be prefabricated by those asked to "provide the facts."

Here is something that should be carefully considered by both "decision-makers" and "fact-providers." No information can be any better than the sample used as its basis. Sampling techniques are as important as investigative methods. Correct information is not necessarily complete information and may therefore be misleading. Association of facts is not necessarily proof of a cause and effect relationship. The importance of a decision should determine the amount and type of information that is gathered. Good two-way communication and mutual trust are basic requirements for intelligent decision-making. The investigator should have a complete understanding of the problem. He should be critical of his own methods. The decider should be aware of the limitations of the information he uses.

PAUL E. RAMSTAD

RECENT CONCLUSIONS REGARDING

Vitamin B_6 in Human Nutrition

By Lyon P. Strean, Merck Sharp & Dohme Research Laboratories, West Point, Pennsylvania

THE EXISTENCE OF a nutritional factor which was distinct from other members of the B-complex was reported in 1934 by Gyorgy (1). This vitamin, B_6, was isolated in 1938 by five different groups of investigators and synthesized by Harris and Folkers (2) in 1939.

In the years following the discovery of vitamin B_6 a large number of investigations were undertaken to study the matabolic activity of this vitamin. These studies included the three naturally occurring substances with vitamin B_6 activity, namely pyridoxine, pyridoxal, and pyridoxamine, each of which can also be made synthetically.

The B_6 compounds owe their vitamin activity to the ability of the organism to convert them into the enzymatically active form — pyridoxal-5-phosphate.

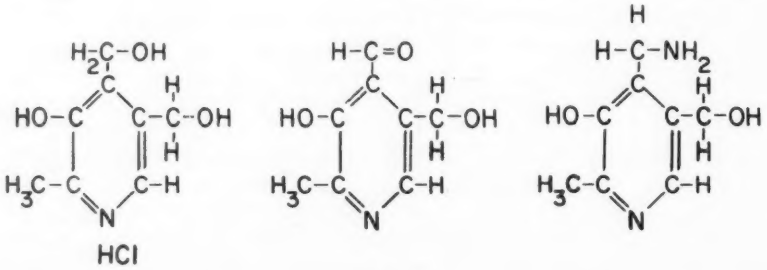
Table I. Dietary Sources of Vitamin B_6[a]

	γ/100 g.		γ/100 g.
Apple	26	Orange juice, fresh	18–56
Banana	320	Pork	330–680
Barley	320–560	Potato	160–250
Beef	230–320	Rice, whole	1030
Cabbage	120–290	Rice, white	340–450
Carrot, raw	120–220	Rye	300–370
Cheese	98	Salmon, fresh	590
Corn, yellow	360–570	Soybeans	700–1200
Corn grits	200	Wheat bran	1380–1570
Eggs, fresh	22–48	Wheat germ	850–1600
Kidney, beef	350–990	White flour	380–600
Liver, beef	600–710	Yeast, bakers'	620–700
Milk, whole	54–110	Yeast, brewers' dry	4000–5700
Molasses, blackstrap	2000–2490		
Oats, rolled	93–150		

[a] Micrograms per 100 g. of edible portion. (See reference 3.)

Need for B_6 in Physiologic Stress

Human deficiency of this vitamin may be manifested by aberrations of amino acid metabolism as well as by other biochemical and clinical abnormalities. One of the first pathologic pathways to be investigated related to the utilization of tryptophan.



Pyridoxine hydrochloride — Pyridoxal — Pyridoxamine

Some of the dietary sources of vitamin B_6 in various foods are found in Table I.

The importance of vitamin B_6 in human nutrition was recognized after studies in which this vitamin was found to participate in a great many enzyme systems involving deamination, decarboxylation, and transamination — all of which are essential for metabolic utilization and transformation of amino acids.

Even with only a relative vitamin B_6 deficiency, an extra load of tryptophan will increase the urinary excretion of xanthurenic acid.

Increased urinary excretion of xanthurenic acid observed in pregnant women led to the discovery that pregnant women usually utilize vitamin B_6 to a greater extent. For this reason obstetricians have recognized the importance of supplementing the diet of gravid women with this vitamin. Fortification of food products, such as cereals, with vitamin B_6 would seem to be a logical step toward satisfying the needs of individuals who may require more of this vitamin.

Pregnancy is a form of normal physiologic stress where the demand for vitamin B_6 is increased. Any disease process is regarded as an abnormal physiologic stress phenomenon. Therefore, vitamin B_6 deficiency is a possibility in a number of disease processes.

Two other forms of stress are also recognized, namely, traumatic and emotional. The organism responds to these forms of stress in fashions similar to those observed in a disease process. The result in severe, prolonged stress might be sufficient to increase the requirement for vitamin B_6. Thus, fortification of food with vitamin B_6 to help meet such possible stressful conditions could be considered a reasonable prophylactic measure.

An unusual amount of stress in women in the first three months of pregnancy may result in a still-birth or miscarriage, or a child with a congenital abnormality. This hypothesis has been confirmed in retrospective

studies involving thousands of pregnancies. In animal experiments a large variety of congenital defects have been observed in offspring when mothers were subjected to various forms of stress, including vitamin-deficient diets or injection of hydrocortisone (see the first two photographs.) It is most interesting to note

Cleft palate in offspring of cortisone-treated mouse.

Normal palate in control mouse.

that these abnormalities can be prevented by administering large quantities of pyridoxine at the same time that the hormone is injected. Thus vitamin B_6 may play a significant role in the prevention of congenital abnormalities. The possible importance of this observation cannot be overemphasized.

Relationship of B_6 in Dental Caries

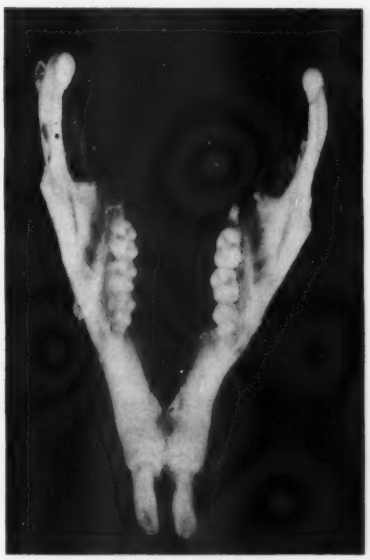
Over the years some physicians and dentists have thought that pregnant women were more susceptible to dental caries than nonpregnant women. However, well-controlled studies were lacking. In recent years two independent studies were made in the island of Tristan da Cunha, in the South Atlantic, suggesting this conclusion. The inhabitants of this island show marked resistance to tooth decay, but more caries occurred in women who bore children — the more children the greater the number of carious or missing teeth. Though living conditions on this island differ from those in the United States, nevertheless these observations suggest a new avenue of approach to the problem of dental caries, including the relationship of vitamin B_6 to the carious process.

Resistance to tooth decay was observed in individuals working in sugar plantations where sugar cane is chewed much as we chew gum. Though lacking in good oral hygiene, the teeth are relatively free of caries. Sugar cane contains high concentrations of vitamin B_6 — over 400 p.p.m.; therefore, it is theorized that this vitamin accounts for the protective action. To explore this hypothesis, other investigations were undertaken.

A notable advance was made when two groups of investigators, at the University of Chicago and Notre Dame University, studied germ-free rats. None of these animals developed dental caries, even though they were reared on a diet which usually produces a large number of cavities in their teeth. This study proved conclusively that bacteria are essential to the development of dental caries. Thus, the study veered in the direction of bacterial nutrition. It soon became evident that the organisms constantly associated with tooth decay are of the homofermentative variety, that is, they produce only lactic acid from glucose. These organisms do not require vitamin B_6 as an essential nutrient and some strains are unable to utilize this vitamin. In contrast, the heterofermentative organisms, not associated with dental caries, which ferment glucose and other sugars, producing some lactic acid in addition to other volatile acids, require vitamin B_6 for growth and reproduction.

The next step was to study the effect of pyridoxine in plate cultures of these homo- and heterofermentative organisms. Indeed, the latter grew at the expense of the former. In animal studies with hamsters (see photographs) and in human studies, supplementation of the diet with pyridoxine reduced the incidence of dental caries significantly in the former and suggestively in the latter, when compared with control groups which did not receive adequate amounts of this vitamin.

Carious lesions in teeth of hamster fed cariogenic diet (pyridoxine hydrochloride, 0.5 p.p.m.).



Teeth of hamster fed cariogenic diet (pyridoxine hydrochloride, 10 p.p.m.).

In the human studies the treated children received lozenges containing 3 mg. pyridoxine (t.i.d.). It is be-

lieved that fortification of cereals with pyridoxine would be an ideal way for children and adults to receive more of this essential vitamin.

Further Indications of Need for B_6

Under various forms of stress, such as trauma, menstruation, and severe emotional disturbance, individuals frequently develop canker sores and other inflammatory conditions in and around the oral cavity. Under these stressful conditions fortification of the diet with this vitamin appears reasonable as a prophylactic measure.

One of the most striking examples of vitamin B_6 deficiency was observed in a group of infants fed a synthetic milk product in which the vitamin B_6 content was destroyed by a change in the processing of this food product. The infants developed convulsions and a severe diarrhea. Supplementation of the diet with vitamin B_6 relieved the infants of these symptoms and the stool returned to its normal texture. Extensive laboratory studies revealed that the diarrhea resulted from a change in the intestinal flora where the normal saprophytes were replaced by proteolytic organisms which do not require vitamin B_6 as an essential nutrient. Supplementation of the diet with pyridoxine established a normal intestinal flora by reverting to a preponderance of *Lactobacillus bifidus*, which requires pyridoxine for growth and reproduction.

The foregoing are examples of conditions in which a deficiency of vitamin B_6 seems to play a significant role. Since this vitamin is essential to protein synthesis and enters into carbohydrate and various forms of fat metabolism, there is no doubt that B_6 is an important factor in many metabolic processes.

While many natural foods contain adequate concentrations of vitamin B_6, some individuals may not partake of these foods. Furthermore, the vitamin content may be reduced because of the heat-processing of some foods. Therefore, it would appear reasonable to fortify foods with vitamin B_6 in a manner that would preserve the potency of this vitamin. Cereals sprayed with pyridoxine hydrochloride would satisfy a portion of the daily requirement.

Summarizing Comments

The mysteries of vitamin B_6 metabolism are being explored by many investigators. Some have used antagonists to produce deficiency states, but the results are never as definite and as clear-cut as those observed in animal experiments. Sometimes vitamin B_6 deficiency may be obscured by the symptomatology, which resembles deficiency of other vitamins. These subtleties frequently cloud the fundamental etiologic factors.

Recent studies have shown that vitamin B_6 is essential for the conversion of tryptophan to niacin and methionine to nicotinamide. Thus patients not already receiving enough niacin may show symptoms of niacin deficiency which would not occur if sufficient B_6 were present. Such obscurities and absence of clearly defined symptoms have impeded progress towards recommendations for a minimal daily requirement. Another important fact seems to be overlooked in respect to those individuals who require abnormally high concentrations of this vitamin. The requirement for different individuals varies, and may vary for the same individual in different situations. Since pyridoxine hydrochloride is nontoxic, it would appear reasonable to provide an excess rather than suboptimal quantities.

In an era when chemotherapeutic agents and antibiotics are used very frequently, interference with the function of vitamin B_6 must be expected. When a deficiency occurs, increased intake of this vitamin should be considered.

Since cereals offer a convenient medium for supplementing the diet with essential vitamins and minerals, manufacturers should consider including in their product some of those vitamins which heretofore have been overlooked. Vitamin B_6 is a notable example.

Conclusions

On the basis of recent investigations, the following conclusions regarding vitamin B_6 seem justified:

1. It is essential for human life.
2. It is essential for normal functioning of the nervous system.
3. It is necessary for protein and fat metabolism.
4. A severe deficiency may cause convulsions in infants.
5. The requirement is increased during pregnancy.
6. Seborrheic dermatitis, glossitis, and cheilosis can be attributed to vitamin B_6 deficiency.
7. B_6 is essential in the maintenance of a healthy oral flora for the prevention of conditions in the mouth which may be attributable to microorganisms which do not require this vitamin as an essential nutrient. Animal studies indicate and clinical trials are highly suggestive that vitamin B_6 aids in the prevention of dental caries.
8. According to recent studies, administering supplementary pyridoxine hydrochloride substantially reduces the incidence of congenital abnormalities in cortisone-treated animals.

Literature Cited

1. Gyorgy, P. *Nature 133:* 498 (1939).
2. Harris, S. A., and Folkers, K. *J. Am. Chem. Soc. 61:* 1245 (1939).
3. Orland, F. J., *et al. J. Dental Research 33:* 147 (1954).

CORRECTION AND ACKNOWLEDGMENT

The author regrets that through an error in the manuscript for the paper, "Modified Corn Starches" by James W. Evans (CEREAL SCIENCE TODAY 3:81; 1958), acknowledgment of the source of the six charts was omitted. These should have been credited to a booklet, "The Story of Starches," published by National Starch Products, Incorporated.

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MECCA FOR THE BAKING INDUSTRY

The American Institute of Baking

By Howard O. Hunter, President, American Institute of Baking, Chicago, Illinois

GIVING US THIS day — and every day — our daily bread is the task of the 20,000 retail and wholesale bakeries of America. Helping to make it an even better bread, more nutritious, fresher, and more tempting, is the aim of the 39-year-old American Institute of Baking, located in Chicago.

When the baking industry was formally organized, a plan for a scientific and educational center was proposed. The close relationship between bakers and chemists was recognized at an early bakers' convention when a chemist, William Jago of England, was chosen as the first honorary member of the organization.

Science remained foremost in the minds of planners with the establishment of laboratories in 1919. Because of limited funds, space was rented at the Dunwoody Institute in Minneapolis. A nine-man board of leading scientists appointed by the National Research Council worked with Institute staff members on problems of both practical and scientific interest.

The purposes of AIB, as stated in its by-laws, are "to promote the cause of education, in nutrition, and in the science and art of baking, for the advancement of the baking industry and the welfare of mankind . . . to disseminate information and to . . . conduct a school or schools and departments for theoretical and manual instruction, laboratories for chemical analysis and scientific research."

The Laboratories

As the scientific center of the industry, the Institute conducts an active program of fundamental research; it maintains a service laboratory and an experimental and pilot bakery. The laboratories have a technical staff of eleven under the direction of Welker G. Bechtel. A scientific advisory committee made up of 15 scientists from universities, research institutes, and industrial laboratories, gives guidance and counsel to the staff.

Research projects undertaken by the Institute laboratories have been supported by grants from foundations, associations, and individual companies. In addition, the laboratories have research contracts with the U. S. Department of Agriculture and the Army Quartermaster Corps. Projects to be accepted must give promise of results of value to the entire baking industry. The findings are made available to the industry, through bulletins to Institute members and through articles in scientific journals.

Howard O. Hunter, President, American Institute of Baking.

Three of the laboratories' most important projects are being financed under a $500,000 grant from the Max C. Fleischmann Foundation. The first, on the nutritive value of wheat, flour, and bread, is aimed at establishing ranges and average values for the amino acids, vitamins, and minerals of wheat, flour, and bread, and their gains and losses at various steps of processing. The first of a series of reports on this research was published in the September 1957 issue of CEREAL CHEMISTRY.

Another of the studies financed by the Fleischmann Fund is an investigation of the possible sources of contamination of cream-filled bakery foods with food-poisoning bacteria. As a part of this research a survey is being conducted on the bacteriological condition of the raw materials used and the effects of processing in the bakery and subsequent handling on the bacterial content of finished products.

The third Fleischmann project is concerned with changes in flavor and aroma of bread as it stales. A study is being made of the nature and amounts of chemical substances which give rise to the flavor and aroma of fresh bread, in order to determine how these substances change during the staling process.

Freezing of bakery products other than bread and cake is being studied under contract with the U.S. Department of Agriculture. The aim of this project is to determine the effect of rates of freezing and defrosting, storage time, and temperature of frozen storage on the palatability of a variety of bakery foods.

The function of the service laboratory and the experimental and pilot bakery is primarily to conduct analyses and tests of ingredients and products for individual companies. The service laboratory makes tests of

Ten thousand square feet have been added to the building that houses the American Institute of Baking. The $200,000 addition has been made to the north and east wings of the U-shaped structure at 400 East Ontario Street, Chicago. The added area provides space for a large research laboratory, the Louis Livingston Library, department of bakery sanitation, a student lounge, an educational materials laboratory, and an employees' lunchroom.

extraneous matter, of ingredient specifications, of enrichment constituents, and of the caloric value of bakery foods.

The functional properties of ingredients are evaluated in the experimental bakery. Pilot-scale bread-baking equipment is available which permits test baking under simulated commercial conditions.

In addition, the laboratories and bakery conduct a limited amount of independent research and assist the research staff by making analyses and by producing baked products required for the various projects.

The School of Baking

The second department to be established was the School of Baking, necessitating larger quarters than were available at Dunwoody. Accordingly, the Wahl-Henius Institute of Brewing in Chicago was purchased. Here was begun the basic course in Baking Science and Technology, which to date has graduated over 2,700 students into the baking industry and allied trades. In this course, men are taught the "why" in addition to the "how" of good baking practices. Most of the men who are graduated from this program return to supervisory positions in their companies. More than 1,000 military personnel also have taken this course.

This 20-week course for the development of supervisory personnel is divided into two 10-week sections. During the first 10 weeks, the principles of chemistry and physics and their relationship to bakery ingredients and bakeshop practices are studied. Lectures and classroom discussions are supported by student experiments in the science laboratory and experimental bakery. During the second 10 weeks, the students use the facilities of the bread-and-roll and sweet-goods bakeries and the maintenance shop, supplemented by lectures, score classes, and demonstrations. The Institute's School of Baking is unique in that each day's production constitutes an experiment demonstrating the effect of a variable, or variables, on the quality of the finished product.

Students have an unusual opportunity for obtaining technical information, since staff members of the laboratories and department of bakery sanitation are among the lecturers, in addition to the full-time school faculty. Enrollment is made up of men both from the baking industry and its allied trades. Instruction in baking science and technology gives the mill chemist a better understanding of baking problems, and helps the baker by broadening his knowledge of fundamentals, thereby preparing him for advancement in his field. The expanded usefulness of these employees is of benefit to management also.

In addition to the baking science and technology course, four short courses are given during the year for men in the various segments of the baking industry. The newest of these courses is the 11-day production management seminar for production superintendents, emphasizing the fundamental principles of communication, supervision, and labor relations with secondary consideration being given to the day-to-day problems in production.

Sales-management seminars of 11 days' duration, designed for bakery executives responsible for sales management, are planned to focus the attention of sales-management personnel on the advancement of the baking industry as a whole, instead of techniques of intra-industry competition.

Maintenance engineers are shown ways to keep equipment at maximum efficiency in the 6-day bakery equipment maintenance course. It is taught primarily by authoritative speakers from the baking industry and equipment firms.

For nonbakers in the allied trades (supplies, ingredients, and equipment) a 2-week course in baking is offered yearly. Lectures are supplemented by bakeshop experience, with emphasis on understanding the baker's problems.

An educational advisory committee, composed of 15 men prominent in the baking industry, informed on its trends and problems, works closely with the school program. It meets semiannually, and its members confer frequently with Robert W. English, AIB's director of education, to assure coordination between the needs of the baking industry and the courses being offered by the School of Baking.

Louis Livingston Library of Baking

The library is an integral part of the Institute. With its specialized collection it attempts to shift and enlarge its scope to keep up with changing interests of the Institute and the baking industry. It emphasizes baking literature, food chemistry and technology, and nutrition.

Each research project starts with a search of the printed literature. Through periodicals received and marked, the librarian attempts to keep the staff alerted to new information and trends. Here, too, the students of the School of Baking, assigned regular library periods, are assisted in finding special information covering their particular fields of interest.

Into the library are channeled many of the requests for information that come to the Institute. The staff attempts to provide satisfactory responses to all. These requests often are answered by a "package library," a collection of clipping and pamphlet

materials from the vertical files. On other occasions much research must be done. Numerous individuals come to the Institute and use the collection for considerable periods of time. This department aids the entire industry as well as Institute personnel.

Consumer Service Department

Within the decade following the purchase of the Chicago headquarters of the Institute, a department of nutrition was established. For a time this department had its offices in New York City, but in 1944 the program was greatly expanded and the Consumer Service department established. A test kitchen was equipped in the Chicago building, and all activities of the department were centered around it. From the beginning, the program of the department has been a twofold one: the preparation and distribution of nutrition education materials, and the development and dissemination of product (bakery foods) information through the work of the test kitchen.

The same basic areas still make up the program, but in greatly expanded activity. From the original staff of three, a nutritionist, home economist, and food publicist, the Consumer Service department staff now numbers 24 and is directed by Mrs. Ellen H. Semrow. Of the professional staff of 15 members, one is a journalist and 14 are home economists. Each has come to the Institute from a special background — nutrition, recipe development, or journalism.

Approximately four years ago, the activities directed toward education fields were appreciably strengthened with the formation of a Consumer Service advisory committee. Its seven members are leaders in the fields of medicine, health and nutrition, education, science, and communications. One of the committee's functions is to advise on the planning of publications and educational programs.

The latest division of the Consumer Service department, a field staff of nutritionists, is now in its fifth year. This staff is composed of seven nutritionists who work in all the states of the nation. They constantly enlarge their services as they reach new groups in schools, hospitals, public health, extension service, and the mass-communications agencies. In 1957, they held 424 meetings and worked with 518 school lunch projects and 372 dietitians, to name only a few of their activities.

Louis Livingston Library, American Institute of Baking.

Another important phase of the nutrition education program is the development of publications. These are written for use in elementary and secondary schools and also for adults. The fourth edition of the pocket sized booklet on weight control, "Eat and Grow Slim," has been published. The syndicated nutrition feature, "Food Sense, Not Nonsense," released as a cartoon-illustrated article, had a 1957 circulation of over six million and was published in 1,350 different newspapers.

The most diversified area of the department is related to product information. The major portion of this information is distributed through mass-communications media — radio and television, newspaper, food columns, and magazines.

Department of Bakery Sanitation

It takes more than a clean surface to meet today's rigid sanitation standards. That is why the Institute places such emphasis on the department of bakery sanitation. Under the direction of Louis A. King, Jr., the department divides its activities into three major categories, all aimed at producing an outstanding sanitation record for the baking industry and the producers of ingredients for the industry.

Eight field sanitarians are located throughout the country, so that the program is available to all bakeries within the country on an equal basis.

The department assigns an adjective rating to each plant inspected, ranging from superior through excellent, satisfactory, passable (above minimum regulatory requirements), to unsatisfactory. Certificates of participation are awarded to all plants

One of the research laboratories, American Institute of Baking. It is here that the work on the amino acids in wheat, flour, and bread is being done.

achieving a passable or better rating and a certificate of achievement is awarded to those in the ranges of excellent and superior.

At the inauguration of the program, the services were available only to bakeries; however, over the past several years, the program has been expanded to include flour mills, ingredient manufacturers, and other allied cereal industries.

Compliance with the department's recommendations has been excellent and in only a few instances has it been necessary to withdraw the services from plants because they did not cooperate to maintain a minimum standard of sanitation.

The most important educational function of the department is the special course in bakery sanitation which is held once each year at the Institute. To date, 37 courses have been held with 1,416 persons in attendance. In addition to the regular course in bakery sanitation, special courses have been held for individual companies and for other interested groups.

Another educational function of the department is the monthly preparation and mailing of posters dealing with sanitation and safety. These are designed for use within the plants and are used as an employee reminder of the importance of sanitation.

The staff of the department of bakery sanitation takes an active part in the production of standards through the Baking Industry Sanitation Standards Committee. To date, 15 standards which deal with the design, construction, and installation of baking equipment have been produced. The standards of design so far developed have done much to improve the cleanability of new equipment.

The Quarters and Equipment

Because of the expanding programs of the Institute, new headquarters were needed to accommodate the ever-increasing need for space. In 1950 the new million-and-a-half-dollar building in the heart of Chicago's medical and university area was dedicated, and a $200,000 addition was opened in 1956 at 400 East Ontario Street. Most of the machinery and equipment in the school and laboratories has been donated, loaned, or consigned to the Institute by equipment manufacturers, or as a gift from bakers' associations, groups, companies, or individuals.

VIEWS AND FINDINGS REGARDING

Unsaturated Fat In Human Nutrition

By Laurance W. Kinsell and George D. Michaels, Institute for Metabolic Research, Highland-Alameda County Hospital, Oakland, California*

PARTLY AS THE result of progressively improving methodology, the subject of lipid biochemistry and metabolism is increasing in interest. In no small measure this reawakened interest has been attributable to the fact that atherosclerosis is a major public health problem; lipids are prominent in the lesions of atherosclerosis.

Almost forty years have elapsed since lesions in experimental animals, closely resembling those seen in human atherosclerosis, were produced by feeding large quantities of cholesterol-containing food. The animals used in these studies were for the most part rabbits, which normally have little or no cholesterol in their normal dietary pattern. As a result of this observation, and a great multitude of other similar observations which followed, many observers have believed that dietary cholesterol is a major factor in the causation of human atherosclerosis. As a corollary to this, it was stated in many quarters that dietary fats in general were causally implicated in the production of the atherosclerotic lesions, and that, therefore, fats were fats, all of them were bad, and should be largely excluded from the diet.

In 1950 we had occasion to carry out a study on a patient on the metabolic ward in which we fed very large amounts of fats. Since the diet was set up on a chemically constant basis, the fat was administered as an emulsion. Vegetable fats were used in the preparation of the emulsion, since these fats were liquid at room temperature. The study, *per se*, had nothing to do with atherogenesis, but in the course of it we followed the cholesterol and phospholipids in the plasma, and found to our surprise a very marked decrease in the level of these materials. Subsequent studies, in which other constituents of diets were varied, indicated that whenever a diet contained a relatively large amount of a number of vegetable fats, including cottonseed, corn, soy, and, more recently, safflower oil, a profound and maintained fall in the level of plasma lipids resulted.

This observation raised the question of the mechanism of the effect. In essence, it seemed that it should be referable either to the absence of something, or the presence of something, or the combination of both insofar as these vegetable fats were concerned. Since it was found that the administration of calorically equivalent amounts of animal fats would result in a prompt rise in the plasma lipids, and since a major difference between animal fats and vegetable fats is the presence of cholesterol in the former and the almost complete absence of cholesterol in the latter, this matter was investigated. Rather huge amounts of cholesterol were added to diets containing large amounts of vegetable fats, but little or no rise in the level of plasma lipids resulted. Apparently, then, the mere absence of cholesterol was not a vital factor.

Vegetable Fat Studies

Vegetable fats contain characteristic sterols and phospholipids. Studies were carried out in which large amounts of such sterols and phospholipids were administered. In the case of the sterols, on occasion slight diminution in plasma lipids would result, but these changes were of small magnitude and were extremely erratic. Where the vegetable phosphatides were administered, rather striking decreases in the level of plasma lipids were observed in a few instances; for the most part, however, no such changes occurred. In retrospect, it would appear that the preparations which produced the decrease in plasma lipids were those which contained very appreciable amounts of polyunsaturated fatty acids.

Unsaturated Fats

Our studies during the past several years have concerned themselves with evaluating the effect of the polyunsaturated fatty acids that are characteristic of the vegetable fats which produce less of the plasma lipids. When one titrates coconut oil, a vegetable fat which contains virtually no linoleic acid, against the other vegetable oils noted above, the coconut oil administration is associated with levels of blood lipids essentially identical with those seen when equal amounts of animal fat are administered; whereas with the high linoleic acid-containing fats, characteristically low levels are observed. During the past 18 months we have had available purified preparations of ethyl linoleate. Such preparations produce as great a decrease in the level of plasma lipids as do vegetable fats containing equal or greater amounts of linoleic acid. It is of interest, also, that the level of plasma lipids on diets containing no fat whatever is very significantly higher than the level observed when the linoleic acid preparations are administered. When ethyl esters of oleic acid are substituted for linoleic acid, plasma lipid values approximate those on the fat-free diet.

*Presented at the 42nd annual meeting, San Francisco, Calif., May 1957.

Implications Now Seen

From the foregoing, therefore, it would appear that in some way linoleic acid, and very possibly other more highly unsaturated fatty acids not yet available in pure form, produce and maintain a profound lowering of plasma cholesterol, phospholipids, and glycerides in the plasma. Such an effect may be referable to decreased production, to increased utilization or excretion, or to a combination of two or more of these factors. There is some evidence which suggests that on occasion, at least, there may be greater excretion of sterols in the stool and greater excretion of cholic acid, a metabolite of cholesterol, when unsaturated fats are given.

It is our own belief, based on as yet highly inadequate evidence, that this is not the major explanation. Rather, we postulate that in the presence of adequate amounts of essential fatty acids (linoleic acid and more highly unsaturated fatty acids which can be formed from linoleic acid), the over-all efficiency of fatty acid transport is greatly increased. Since the glycerides, the phosphatides, and the cholesterol esters are concerned with the transport of fatty acids, we suspect that, as a result of improved efficiency of fatty acid transport in the presence of very adequate amounts of linoleic acid, the need for synthesis of the cholesterol esters and phospholipids decreases, and consequently, lower blood levels are observed.

In this connection, it will be recalled that cholesterol esters are rich in the unsaturated fatty acids and that the lecithin type of phospholipid contains one molecule of polyunsaturated fatty acid in it per molecule of lecithin. Much work will be required until the final answer is obtained.

It is unfortunate that, because of major species differences, work carried out in experimental animals is not applicable to the human problem. By the same token many of the quantitative studies, particularly those using isotopic tracers, are extremely difficult in the intact human.

The Human Dietary Picture

Insofar as the clinical side of the picture is concerned, it would seem that until further knowledge is obtained we may well assume that inclusion of adequate amounts of linoleic-acid-containing fats in the diet is most desirable. This by no means suggests that one should exclude sources of saturated fat. Studies during the last four years suggest that reasonably definite ratio relationships exist but that these ratios vary considerably, depending upon the age and clinical status of a given individual.

In very round figures, 10 to 20 grams per day of linoleic acid in the diet of a young adult male are sufficient to maintain lipids in what we consider a normal range, the diet being otherwise properly balanced. The older the individual, the relatively greater amount of linoleic acid is required, and the relatively lesser amount of saturated fats and concentrated carbohydrates can be permitted. In older individuals with known atherosclerosis, it may be necessary for a time to exclude saturated fats from the diet entirely and to give very large amounts of linoleic-acid-containing fats in order to achieve the desired level of plasma lipids. When this level has been achieved, it may frequently be maintained with very much less rigorous diets.

Excessive amounts of saturated fat should probably be avoided at all times; and in particular, hydrogenated dietary fats should be completely excluded.

IMPORTANT FACTORS INVOLVED IN

Evaluation of Grain Fumigants

By Eugene E. Kenaga, Agricultural Chemical Research,
The Dow Chemical Company, Midland, Michigan

FUMIGANTS AND COMPONENTS of fumigant mixtures for the control of grain insects are evaluated in the laboratory under various field-simulated conditions. Some of these variables and their influence on the over-all performance of fumigants are: 1) condition of the grain in storage; 2) nature and conditions of the insect infestation; 3) methods of applying fumigant; and 4) characteristics of the fumigant. Each of these variables will be discussed briefly.

Conditions of Grain in Storage

Assuming average conditions, more fumigant is sorbed by grain (a) at low temperatures, (b) when the moisture content is high, and (c) when dockage content is high. The composition of the grain is an important factor, more fumigant being needed when the grain is packed or caked and thus interseed spaces are small, and when sorptive properties are high. The shape of the grain mass affects dosage requirements and the type of fumigant mixture most adaptable to the situation.

Insect Infestations

The location of the infestation may affect the method of applying the fumigant, the dosage, and the ingredients. Dosage and ingredients also are dependent on the species of insects present and their life stage or stages at the time of fumigation. Cold temperatures increase the dosage necessary for satisfactory control.

Surface Spray — Gravity Distribution

With this method, insect control depends on the natural dispersion of fumigant vapors through the grain mass and on the fumigant-sorptive properties of the particular species of grain.

Advantages of this type of application are that the fumigant is easily applied and very little equipment is required. In fact, it is merely poured or otherwise released over the top surface of the grain mass. After the desired exposure period, the fumigant may be eliminated from the grain by leakage through the bin walls and/or by opening doors, windows, and other structural openings.

There are disadvantages, however. Many hours, or with some grain species, several days, are required for adequate penetration of the fumigant vapors to all depths of the grain mass.

In actual practice, with this method of distribution the vapors of the components of fumigant mixtures separate in a manner similar to that in a chromatographic column. Each ingredient has its own sorption pattern and separates — regardless of the original composition — at various depths in the grain according to its chemical and physical properties. Therefore there must be various types of ingredients in the mixture to kill insects at various depths and locations in the grain. For maximum effectiveness, ingredients should be balanced for each grain being fumigated. However, practical considerations limit the extent to which this balancing is commercially feasible. In general, liquid grain-fumigant mixtures are highly satisfactory for surface use.

Forced Distribution with Recirculation

Here the fumigant is introduced into the storage area where a closed forced-air system exists. Vapors are forced through the grain and then recirculated by means of fans until the distribution is relatively uniform. The fumigant penetrates rapidly to all parts of the bin and little of it is lost by sorption.

A single fumigant of suitable properties (such as methyl bromide) is adequate, since a properly functioning recirculation system distributes it throughout the storage bin, in contrast to gravity distribution where sorption due to delayed penetration reduces the effectiveness of the insecticide.

After the required exposure period, the fumigant may be removed from the grain very rapidly by simple adjustments in the air distribution system. Thus, problems such as possible residues, adverse effect on germination, and grain handling hazards are greatly minimized.

A possible limitation in the use of forced recirculation equipment is the cost of installation and the requirement for very tight storage conditions. However, the method is economically feasible in the larger storages.

Forced Distribution with Ventilation

With this equipment the vapors are distributed through aeration ducts, by directing the air stream either upward or downward through the grain mass until an effective concentration of gas is reached throughout the mass of grain. The aeration system is then turned off and duct openings are sealed. Fumigants may be introduced in the gaseous state, or liquids may be placed on the grain surface and from there vaporized and distributed with the aid of the aeration system.

Advantages of this method are the rapid distribution of the fumigant to most areas in the grain, thus reduc-

ing the necessary exposure time; rapid removal after the exposure period; and comparatively low cost with the use of equipment already installed in many storages.

Disadvantages are the need for careful control of the equipment to avoid wasting fumigants; the requirement of gas monitoring equipment and the experience necessary to determine when maximum distribution has been reached. Gas distribution is not always completely uniform; thus, insect control may be more variable than with the positive forced recirculation method.

Table I. Common Grain Fumigants and Their Relative Fumigation Properties

Fumigant	*Volatility*	*Penetrability (Lack of Sorption)*	*Toxicity to Insects (All Life Stages)*	*Explosive Limits*
				lb/1000 cu ft
Carbon bisulfide	High	Good	Good to fair	1.9–94.4
Carbon tetrachloride	Medium	Good	Fair to poor	Nonexplosive
Ethylene dichloride	Medium	Fair	Fair to poor	15.2–39.1
Ethylene dibromide	Low	Poor	Excellent	Nonexplosive
Sulfur dioxide	High	Poor	Good	Nonexplosive
Acrylonitrile	Medium	Poor	Excellent	4.0–22.4
Hydrogen cyanide	High	Poor	Excellent	3.8–26.8
Methyl bromide	High	Good	Excellent	31.8–34.2

Fumigant Characteristics

Each fumigant has certain physical and chemical properties peculiar to that material. A variety of these properties is needed for successful fumigation of grain. The problem is to select the best combination with respect to the kind of grain, insect infestation, storage facility, application techniques, and other factors affecting the particular case at hand. In Table I some of the commonly used fumigants are listed, together with an evaluation of their properties with respect to grain fumigation.

Generally speaking, the cadelle, the black carpet beetle, and the confused flour beetle are among those insects most resistant to fumigation. Surface-infesting species such as the Indian-meal moth and the Angoumois grain moth are difficult to control; reinfestations occur quickly because of poor residual qualities of many fumigants in the surface area of the grain bin.

Characteristics of Liquid Fumigant Mixtures

Only carbon bisulfide, carbon tetrachloride, and methyl bromide are rated as having good penetrating properties (see Table I). Carbon bisulfide has many desirable properties as a fumigant, but is highly explosive. Carbon tetrachloride also has many favorable properties but is not sufficiently toxic to insects. A mole ratio of at least 1.15 of carbon tetrachloride to 1 of carbon bisulfide in air is necessary to render the mixture of these fumigants nonexplosive. Since carbon bisulfide is more volatile than carbon tetrachloride, even the 80–20 mixture (80% CCl_4–20% CS_2 by liquid volume) is flammable under some conditions. For this reason only small percentages of carbon bisulfide are included in the most modern liquid grain fumigant mixtures. The most flammable ingredients are softened by dilution with carbon tetrachloride. Examples of fumigants incorporated into liquid mixtures for commercial fumigation of grain are shown in Table II.

The mixtures mentioned above and shown in Table II vary, not only in fumigant ingredients but also in relative fumigation properties (Table III). It is necessary to determine what the needs are in a particular job, and use the mixture whose characteristics are most suitable. No one fumigant or mixture is ideal for all purposes. However, several mixtures will give good commercial control of insects under a wide variety of conditions.

Fumigant Detection Devices

The success of a fumigation is determined by the completeness of control of all life stages of all insect species in all parts of the grain mass. Thus, the effect on the insects themselves is the most important indicator of whether the fumigant was distributed to the infested areas in suffi-

(Please turn to Page 157)

Table II. Composition of Some Proprietary Liquid Grain Fumigants

Fumigant Mixture	*Carbon Tetrachloride*	*Carbon Bisulfide*	*Ethylene Dichloride*	*Ethylene Dibromide*
	% by wt	*% by wt*	*% by wt*	*% by wt*
Dowfume® 80–20	83.5	16.5	...	...
Vertifume T[a, b]	82.5	16.5	...	...
Serafume®	76.5	10.0	10.0	3.5
Dowfume® 75	29.8	...	70.2	...
Dowfume® EB–5	63.6	...	29.2	7.2

[a] Contains 1% fire suppressant.
[b] T, trademark of the Dow Chemical Company.

Table III. Comparative Activity and Performance of Certain Proprietary Fumigant Mixtures

Fumigant Mixture	*Penetrability*	*Residual Insect Kill*		*Suitable for Fumigation Below 65°F.*	*Flammability Rating*[a]
		Surface	*Below Surface*		
Dowfume 80–20	Excellent	Poor	Poor	Yes	80–100
Vertifume	Excellent	Poor	Poor	Yes	1–5
Serafume	Good	Fair	Fair	Yes	1–5
Dowfume 75	Poor	Fair	Good	No	50–60
Dowfume EB–5	Fair	Good	Good	No	Nonflammable

[a] Underwriter Laboratories, Inc., rating based on ether (100), ethyl alcohol (60-70), kerosene (30-40), paraffin oil (10-20), nonflammable (0).

. . . England

A Glossary of Terms Relating to Powders: British Standard No. 2955 (1958). This Standard, which may be obtained (price 4/6) from the British Standards Institution, 2 Park Street, London, W.1., was prepared under the authority of the Chemical Engineering Industry Standards Committee. The National Association of British and Irish Millers and the Research Association of British Flour-Millers were among the 37 organizations (besides individual manufacturers) directly represented on the committee entrusted with the preparation of the Standard.

The terms defined in the glossary relate mainly to usage in the metallurgical and chemicals industries, but a certain number are of indirect interest in flour milling technology. In the first place, the committee had to take an arbitrary decision in defining a powder by restricting the particles of which it is composed to a maximum dimension of less than 1,000 μ (1 mm.) in any direction. Powders passing a No. 200 mesh B.S. test sieve (76 μ—defined in British Standard No. 410, "Test Sieves") are regarded as of subsieve size.

The following terms and definitions have been selected from the glossary as of some general interest:

Particle size	
Grading	Separation of a powder into fractions.
Classification	Grading in accordance with particle size, shape and density, by fluid means.
Sieving or screening	Grading in accordance with particle size and shape by means of sieves or screens.
Elutriation	Classification effected by movement relative to a rising fluid (see also Centrifugal elutriation).
Sedimentation	Classification effected by rate of fall in a still fluid, usually under laboratory conditions (see also Centrifugal sedimentation).
Settling	Cassification effected by rate of fall in a fluid which may have a horizontal component of velocity.
Centrifugal classification (or elutriation or sedimentation)	Processes as above in which separation is accelerated by means of centrifugal force.
Agglomerate	Assemblage of particles rigidly joined together, as by partial fusion (sintering) or by growing together.
Aggregate	Assemblage of particles which are loosely coherent.
Size fraction	Portion of a powder composed of particles between two given size limits. It may be expressed in terms of weight, volume, surface, or numerical frequency.
Fines or undersize	Portion of a powder composed of particles which are smaller than some specific size.
Oversize	Portion of a powder composed of particles which are larger than some specific size.
Powder properties	
Flowability	Properties of a powder which determine its ability to flow under stated conditions.
Angle of repose	Angle to the horizontal assumed by the surface of a naturally formed heap of powder at rest, obtained by pouring from a container.
Friability	Tendency for the particles of a powder to break down in size during storage and handling under the influence of light physical forces.
Grindability	Ease with which a powder may be comminuted by mechanical means under stated conditions.

The glossary gives, among other definitions, a set serving to distinguish between particles of different shapes and a set dealing with the various ways in which the density of a powder may be formulated. It also gives formulations of Stokes' law and of the Reynolds number, and an example of calculation of a Stokes' diameter with reference to the application of the Reynolds number (to determine whether the fluid flow around the particle is streamline, and the motion within the range of Stokes' law). The various ways of defining "particle mean size" (or "average particle size") of a powder are set out at some length.

C. R. JONES
Corresponding Editor

. . . Australia

A feature of the annual convention of the Institute of Food Technologists (Aust.), held April 29 to May 2 at Canberra, Australia, was the first presentation of the IFT Australian award for scientific achievement. The recipient of this honor was the well-known cereal chemist, R. A. Bottomley. His citation for the award reads as follows:

"He has had a distinguished career in many and various sections of the food industry, having established *the first laboratory in the flour and feed milling industry*, the first research laboratory in the bread-baking industry, and the first research laboratory in the fermentation field.

"In 1943 he won the Grimwade Prize (£100) for Research in Industrial Chemistry (Melbourne University) with his thesis on cereal amylases. In 1948 he was awarded the Quaker Oats Company's Research Fellowship ($5000) at the University of Minnesota, U.S.A., where he worked on the biochemistry of mold growth in grain. The day after his doctorate was awarded, he was appointed assistant professor in the School of Agricultural Biochemistry at that university.

"With over 20 papers to his credit, he has obviously contributed to the advancement of knowledge in the above-listed sections of the food industry. By invitation Dr. Bottomley has lectured in every Australian state and in New York. He has always been unselfish in helping fellow chemists and food technologists and in taking part in the work of their societies. He was a committee member of the Royal Australian Chemical Institute (Victorian Branch) for a number of years; he has been chairman of the R.A.C.I. Cereal Group, and President of the Food Technology Association (South Australia). He is the only member of the Institute of Food Technologists (Aust.), in fact, the only representative of the food industry, to be on both the Food Additives and Food Standards Committees of the National Health and Medical Research Council.

"The successful prosecution of his duties has opened avenues of employment for food technologists and this has done much to enhance the status of our profession in industry."

H. GOVERS, *Chairman*
Northern Australian Section, IFT

People, (Products,) Patter

• • • **People**

Edward A. Beck joins A. E. Staley Mfg., Decatur, Ill., as a development chemist; from Jos. Bancroft & Sons.

Ben F. Buchanan named associate director of product development at General Foods Research Center, Tarrytown, N. Y. **Milton Kaplow** appointed associate technologist, packaging laboratory; from assistant professor of food technology, University of Miami. **Jane M. Molinari** joins research center staff.

Francis Cheng promoted to research and development department, Pillsbury Mills, Inc., Minneapolis, as research chemist in formulation; from raw materials chemist with Pillsbury.

Robert Cooney, research supervisor, and **David Jorysch,** technical director of flavor department, H. Kohnstamm & Co., Inc., appointed assistant vp's. **Samuel Zuckerman,** plant superintendent in Brooklyn, named vp.

Edward Feigon elected vp research and development, Kitchen Art Foods, Inc.; formerly chief chemist.

Richard H. Forsythe received IAPI (Institute of American Poultry Industries) 1958 Achievement Award of $1,000 at a special Awards Dinner on May 27 in Chicago. Dr. Forsythe's research was largely responsible for increased use of whole egg and egg products in prepared cake mixes, icings, and meringues. He also developed special blends of whole egg and egg yolks with sugar, corn syrups, and dextrin products which increased the storage life of these products. Has been director of Henningsen, Inc., at Springfield, Ill.

Philip L. Harris named assistant director of research at Distillation Products Industries.

Wolfgang Huber becomes West Coast representative, Food & Drug Research Laboratories, Inc.

Bill Kahle, Merck & Co., discontinues calling on retail trade following change in duties.

Eric Kneen, vp and research director of Kurth Malting Company, becomes new president of American Society of Brewing Chemists. An active AACC member, writer (primarily in enzymes, starch chemistry, and cereal chemistry), and recipient of distinguished awards, Dr. Kneen in 1947 was voted one of the ten ablest agriculture and food chemists in the U. S.

Karl T. Keller, former director in charge of production and development of Schimmel & Co., A.G., Miltitz, Germany, has joined the flavor & chemical research staff of Fries & Fries, Inc., Cincinnati.

Dr. Keller is well known as one of the foremost authorities in the aromatic field and was connected with Schimmel & Company for over twenty years.

Alexander L. Liepa and **Donald B. Miller** join Procter & Gamble's Foods Division; in development department and products research department respectively.

Rex A. Moses, who received a Bachelor of Science degree in Chemical Engineering from Alabama Polytechnic Institute in June 1955, recently joined the Development Department of the Food Division of Procter & Gamble.

Kenneth W. Nelson joins Products research department, Food Division, Procter & Gamble.

Bernard L. Oser, vp-director of Food and Drug Research Labs, Maspeth, N.Y., received 1958 Babcock-Hart award of $1000 from Nutrition Foundation.

W. W. Prouty becomes director of quality control, Langendorf United States Bakeries, San Francisco; work includes control, development, and research.

Norman Rogers named district field manager, eastern district, central field division of Quaker Oats Company at Cedar Rapids, Iowa; from district representative in St. Joseph feed division. **Grant Bramel,** former sales supervisor of country elevators, named district field manager. Other promotions in country elevator staff: **Charles Sproul** named supervisor of sales and services; **John Hodapp,** from supervisor of services, to Cedar Rapids cereal mill as production trainee.

R. M. Sandstedt and family left for Europe on June 4th for an eleven week tour which will take them through nine European countries. Sandstedt was invited by a West German Research Association

to discuss his work on starch research carried out in the Department of Biochemistry and Nutrition at the University of Nebraska.

He will be lecturing at leading cereal and milling centers in the countries visited.

E. P. Walker of Portland, Oregon, after attending the Cincinnati meetings took a swing around the Southeastern states by easy bus stages, visiting and observing various cities and areas, including Washington, D.C.

Virgil O. Wodicka has been named director of the food division at the U. S. Army Quartermaster Food and Container Institute for the Armed Forces. Dr. Robert G. Tischer, former director of the food division, will serve in the office of the commandant as assistant for special projects. Dr. Wodicka has been serving as associate director of the Institute's food laboratory since 1955.

• • • Products

Laboratory Aids. Most-wanted items offered in "Apparatus Review" No. 8, 1958: atom models; balances; crystal lattice models; demineralizers; dispensing scoops; electrobalances; electrothermal heating items; five-in-one controls; flash-evaporators; gas chromatographs (in a special section in colors); glass tubing gages; combination hot plate/stirrers and magnetic stirrers; stirring bars; lattice support clamps; polyethylene sink traps; safety shields and cylinder supports; stainless-steel beakers; Teflon glands, sleeves, and stoppers; tele-thermometers; the Tempunit. For copies write: Arthur S. LaPine & Co., 6001 S. Knox Ave., Chicago 29, Ill.

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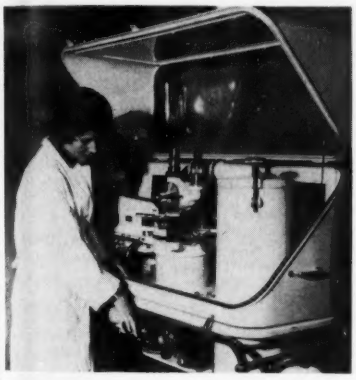
Laboratory Air-Classifier. Miag Northamerica, Inc., have installed a laboratory classifier in their office in Minneapolis, to process samples for customers and to show to interested companies what an air-classifier can do with various materials and separations at very



fine particle sizes (2 to 5 microns as finest cut-point). Materials processed include cement, cocoa, flour, sugar, starch, talc, metal powder, and abrasives. Pamphlets describing the equipment are available from Miag Northamerica, Inc., 1616 S. 8th St., Minneapolis 4, Minn.

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Liquid Feed Supplement – Morea.® Cattle-feeding trials were made at Kansas State College to compare results from feeding Morea (a liquid feed supplement containing ethanol, urea, and phosphoric acid, blended with molasses) with those from a conventional oil-meal ration fed to similar animals. Cattle on the liquid supplement program gained 0.37 lb. (av.) per head per day more than animals on the conventional ration, and other important benefits were noted. The liquid supplement used in the trials was supplied to Kansas State by Feed Service Corporation, Crete, Nebraska.

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Linear polyethylene for packaging. Conolex, a polyethylene film developed from linear resins and introduced at the National Packaging Exposition in the New York Coliseum (May 26-30), is expected to open new areas for film overwrap packaging in the bakery, candy, dairy, snack foods, and cereal industries, among others. The film, which incorporates a number of sought-after qualities such as stiffness, high surface gloss, crystal-like clarity, and ability to withstand a wide temperature range, was developed by Shellmar-Betner Flexible Packaging Division of Continental Can Co., Newark, Ohio. The linearity of Conolex permits opening of a package made of the material by simply tearing a strip of the film, already notched in the linear direction; thus Conolex serves as its own tear tape. Advantages claimed for it are low permeability level for acids and oils, in liquid or vapor form, and excellent tensile strength; on packages, it withstands sterilizing temperatures as high as 250°F. without damage to shape, strength, or color, and as low as 100° below zero without becoming brittle; it is strong and stiff enough to permit easy handling in high-speed, automatic "push-through" packaging machinery. The Food and Drug Administration has accepted it for use with food products. Pretzels, bread, cookies, pastry, cake, crackers, cereals, and many types of candies can be Conolex-wrapped to realize some of the advantages mentioned here.

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Deamidated zein for coatings. A new product called Zein G210 has been developed by the Corn Products Refining Co. of Argo, Ill. Zein, a protein obtained commercially by extraction from corn gluten, belongs to the group of proteins known as prolamines which are soluble in aqueous alcohols but insoluble in water. Up to now, strong alkalis with pH of 11 or higher have been required to get a water dispersion of zein. The new process partially and selectively deamidates zein, and G210 can be readily dispersed in water by weak alkalis. This improved water-dispersibility holds promise of greatly increasing the scope of applications for zein.

The new modified zein produces hard, tough, grease-resistant films that are nonthermoplastic. It can be used to formulate rubless floor polishes, water-based inks, leather finishes, grease-resistant coating for paper, and other products. G210 is compatible in all proportions with shellac, bleached or bleached-dewaxed, and with phenolic-modified rosin esters. It helps to make films of these resins hard and tough.

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Humidity-indicating device. The "Humigraph" is a card, 2 by 6¾ inches, having seven indicator spots whose color changes from blue to pink as the atmospheric humidity changes. The card is scaled to show relative humidity by reference to the color change spots; it reads from 10 to 80% relative humidity. In 5 to 10 minutes the card responds to small changes, and in about 30 minutes to a change as much as 40%. It works at temperatures from 40° to 200°F. Not a one-time indicator, it can be used continuously. The cost being small, Humigraphs can be distributed at all points where it is desirable to observe humidity changes without reading instruments. Andrew Technical Supply Co., 7068 N. Clark St., Chicago.

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Unbreakable plastic measuring graduate. A glass-clear graduate for liquids, made from a tough, lightweight plastic, thoroughly tested as a replacement for glass and unbreakable under normal usage, comes in four sizes, 4, 8, 16, and 32 ounces. Conical, with octagonal base; finish smooth and hard; will not slip when wet; markings in both ounces and metric measure. The company states that graduates are priced lower than the equivalent in glass, with discounts to quantity buyers. Needs Corp., Division 95, 255 W. Euclid Ave., Jackson, Mich.

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An electronic moisture computer is designed for elevator use and operates on 110–115 volts AC. Percent of moisture is read directly from the large central dial; different colored scales are used for the more common grains, and no charts are required for most grains. However, charts are available for all commodities not listed directly on the dial and for high-moisture ranges of certain grains which have only a low-range scale on the dial. New features: "test weight" dial which permits test weight corrections to be made directly for light or heavy samples; "temperature

correction meter," for tests at temperatures other than 80°F. – color coding shows whether correction should be added or subtracted. New accessories: scales with a grain scoop for weighing a 5-oz. sample, and a device for determining the test weight of the sample. Radson Engineering Corp., Macon, Ill.

• • • Patter

The 1958 cereal chemists convention of the Association of Cereal Research met in Detmold, Germany, June 10-12. Speakers and their subjects were:

General cereal problems: O. Fischnich and Dr. Grahl (Braunschweig) – Germinating power of the cereal grain; T. Widhe (Kvarnholmen, Sweden) – Problems of combine harvesting and determination of drying damages; W. Seibel and H. Bolling (Detmold) – Automatic moisture determination with Karl Fischer solution; E. Drews (Detmold) – Water-soluble nonvolatile organic acids in milling products, doughs, and breads; R. Refai (Cairo, Egypt) – A new rapid method for evaluating the cooking properties of rice; J. Hampl (Prague, Czechoslovakia) – New observations concerning the behavior of wheat- and rye-flour suspensions in the amylograph.

Enzymes in cereal grains: W. Franke (Cologne) – Fatty acid dehydrases; M. Rohrlich (Berlin) – Application of the electrochemical O_2 measurement after Todt, for the determination of lipoxidase and catalase in cereal grains; L. Acker (Frankfurt) – Enzymatic alterations in cereal products in relation to moisture.

Cereal proteins: A. H. Bloksma (Wageningen, The Netherlands) – Influence of thiol- and disulfide groups in gluten on baking quality; E. Hanssen (Hannover) – Investigations on cereal and legume problems with the fluorescence microscope; J. Janicki and E. Kaminski (Posen, Poland) – Evaluation of the protein-bound form of riboflavin.

Forum (June 12): H. Krainick (Freiburg) – Detrimental effect of flour on celiac disease and its presumed causes.

Research on starch: R. M. Sandstedt (Lincoln, Nebraska) – Films; 1) relations between structure and digestion of starch granules; 2) starch gelatinization.

Baking problems: F. J. H. Ottaway (Chorley Wood, Herts., England) – The preservation of wheat bread; F. Lamprecht (Ingleheim) – Crumb discolorations in baked goods through weed seeds.

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An excellent technical program and a smoothly operating convention from start to finish sent members of the American Society of Brewing Chemists home from their annual meetings in Detroit, May 4-8, in a well-satisfied mood. At the opening luncheon, Karl H. Hennige, president of the Master Brewers Association of America, commended the ASBC's valuable work to improve beer stability and to establish standard methods of measuring it. A successful innovation was six technical seminars at which Technical Subcommittee chairmen acted as moderators for discussions and exchange of ideas. At the annual banquet, new president Eric Kneen introduced the incoming officers, and Arthur John Vorwald, of Wayne State University College of Medicine, Detroit, talked on "Health at work and at play."

Nineteen papers were presented at the technical sessions. The program was highly diversified and gave members a varied diet of data describing new findings and analytical procedures, compiled by the many laboratories within and sponsored by the brewing industry as well as its close affiliate, the malting industry.

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An improved technique in the use of the Oxygen Bomb Method for determining the oxidative stability of fats, oils, and fatty foods has been announced by Eastman Chemical Products, Inc. With it, more products can be evaluated and less time is required for the test. Details were revealed by Ben N. Stuckey, senior chemist in charge of Eastman's food laboratories, before the annual AOCS meeting at Memphis, Tenn. A dispersing agent which greatly increases the reactivity of the product under test by expanding its surface area is the key to the improved technique.

Because of its greater precision over conventional methods of determining oxidative stability, the Oxygen Bomb Method has received much attention from the food industry during the past year. Its most serious limitation is the lack of uniformity in judging the end point of the induction period, because of variations in the oxidative reactivity of different fats and oils. The use of a dispersing agent within the oxygen bomb not only sharpens the end point but extends the use of the method itself to a wider variety of fats and oils. Other products evaluated include various types of nuts, egg solids, butter oil, pastry and cake premixes, and fatty acids.

Data presented by Dr. Stuckey on a lard stabilized with a Tenox antioxidant indicated that 55 hours were required to reach an end point without the dispersing agent, whereas only 6¼ hours were required with a dispersing agent.

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Marketing organization for NMR Analyzer. To the Schlumberger Well Surveying Corporation (Ridgefield, Conn.), marketing success of the Model 104 Nuclear Magnetic (NMR) Analyzer is no surprise. In response, the company has set up a nationwide organization for sales. A. Russell Aikman, marketing director, mentions these features of the analyzer: "Apart from its use by nontechnical personnel for routine measurement, the Model 104 becomes in the hands of a research chemist a subtle means of probing the makeup and behavior of materials . . . for example, to determine the tightness of moisture binding, to measure the crystallinity of polymers, or to chart the migration of water in permeable solids." These are potentials of this new form of spectroscopy which have barely been touched, he said.

Companies making up the marketing team are: J. J. Maguire Co., Washington, D.C., and South Atlantic States; Atlantex Corp., New England; Harshaw Scientific Div. of Harshaw Chemical Co., Central States; Van Waters & Rogers, Inc., Scientific Supplies Co. Div., Braun-Knecht-Heimann Co. Div., and Braun Corp. Div., Far West; and Pitchford Scientific Instruments Corp., Western Pennsylvania.

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Price reduction for lysine. The Du Pont Company has announced a price reduction – from $12 to $8 per pound – for L-lysine monohydrochloride, "in keeping with Du Pont's policy to broaden markets through price reductions whenever possible," said T. J. Milligan, lysine product manager. "Although lysine is still being produced in pilot-plant quantities," he continued, "the lower price marks one more step toward commercial production of this essential nutrient." Du Pont pioneered in synthesizing the naturally occurring substance, lysine, whose commercial availability is regarded as a significant contribution to efforts to raise nu-

tritional standards throughout the world, since many foods, notably those based on cereal grains, are deficient in this amino acid. Lysine supplementation converts the wheat protein in such foods as bread to a value approaching that of the protein in milk, cheese, and meat.

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New feed plant in Asheville, N.C. Embarking on a long-range construction program for feed plants in areas of concentrated poultry and animal production, Quaker Oats Co. is adding to its bulk finished feed storage facilities in Asheville a new mill to produce Ful-O-Pep poultry feeds. Work began in June and completion is expected in September. I. S. Riggs, Quaker Oats vp in charge of feed sales, expressed his opinion that "The Asheville area has some of the best broiler growers in this part of the country"; they know their business and are building a thriving industry. Feed sales for the new plant will be handled through the company's Chattanooga feed division. Steel bins for storing bulk ingredients and grain will be installed, together with the newest equipment for milling and pelleting, grinding, packing, and automatically controlled batching. A new process of adding animal fats to finished feeds will be used.

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Flavoring extracts. An addition to the Kearney, N.J., plant of H. Kohnstamm & Co., Inc., is expected to increase the firm's production of flavoring extracts by about 200%. The one-story extension will form an L-shaped structure and provide 20,000 sq. ft. of additional floor space; efficiency in layout will permit continuous flow of incoming raw materials and outgoing finished flavors. Paul Kohnstamm, president, said that "the plant addition will include the most modern stills, extractors, continuous centrifuges, and colloid mills, and the latest designs in mixing and material-handling devices." A special feature will be a spray-dryer to produce the company's "entrapped flavors." Up-to-date concepts in plant sanitation will be applied.

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Education grants increased. Grants in aid of education totaling $486,000 for calendar 1958, by The General Foods Fund, Inc., represent an increase of $127,000 over last year. The Fund, an independent foundation sponsored by General Foods Corporation, has made educational grants of more than $1,786,000 since its formation in 1953. The increase largely reflects a new $50,000 "matching grants" program, an increase from four to six in the number of $25,000 grants to individual institutions, and a $35,000 increase in awards to schools of technology. The 1958 program also includes individual grants of $25,000 to Colby College, Harvard University, Kenyon College, New York University, Princeton University, and Yale University. Contributions of $126,000 are being made to scholarship and fellowship funds, and $12,500 to other educational organizations.

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A newly formed American company has become U. S. affiliate of W. J. Bush & Co., Inc., English producer for 107 years of essential oils and food flavors; succeeding the company of that name in Cos Cob, Conn. The new company, R. D. Webb & Co., Inc., will continue operations at the former Bush offices in Cos Cob and at the plant and research laboratories in Linden, N. J. Sales offices in Chicago and Los Angeles will also be continued.

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You may have on request a copy of a 44-page booklet on food preparation and serving equipment used in restaurants and cafeterias, hospitals and institutions, colleges and universities, clubs, stores, trains and ships, hotels and motels, diners and lunch counters, churches, and for the armed forces, with about 150 photographs. The booklet contains a technical section on stainless steel as it relates to the food preparation and serving industries, and a table on the corrosion resistance of stainless steels to various media. Write: Advertising Department, Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pa.

Fumigants

(Continued from Page 152)

ciently toxic concentrations. However, the concentration of each fumigant at any given time or place in the grain bin is not indicated and, therefore, complete control is not in itself useful for research purposes.

To obtain more specific information, certain types of instruments have been developed for monitoring gaseous concentrations of fumigants.

Thermoconductivity units measure all constituents in the air and must be calibrated and adjusted to compensate for normally occurring gases in the atmosphere being sampled. In a mixture of gases with the thermoconductivity unit there is no differentiation between types of constituents present. The lower limits of sensitivity of most fumigant ingredients with this instrument are about 0.06 to 0.12 lb. per 1,000 cu. ft. The unit is extremely sensitive to hydrogen and gases having a molecular weight less than 16. If such gases, which rarely occur in grain, are present in small amounts, large quantities of heavier gases are negated. This situation may lead to a false estimation of the concentration of fumigants present in the air.

High-boiling fumigants and water vapor are difficult to remove from the instrument and cause a lag in recording the true gaseous concentration at any given time.

The use of the *mass spectrometer* makes it possible to differentiate among all ingredients in a gaseous mixture and gives an indication of the concentration of each, within the sensitivity limits of the instrument. The lower limits of sensitivity of most ingredients with this instrument are about 0.01 to 0.05 lb. per 1,000 cu. ft. The mass spectrometer is not a portable unit for field use. Air samples must be taken for each time-location determination and then transported to the unit for analysis. Dosage calculations may be made from these analyses. Considerable time may elapse between collection of the air sample and analysis of its constituents. No on-the-spot determination of the fumigation distribution patterns can be made with this instrument. If many samples are taken, the number of sample containers involved can become a cumbersome problem.

Other methods of determining gaseous concentrations of fumigants have been used, including analytical chemical methods, halide leak detectors, interferometers, infrared spectrometers, and vapor-phase chromatography. Each of these methods has advantages and disadvantages. However, constant improvements in technology may allow modifications of old methods or development of new methods with distinct advantages over the present cumbersome or less than adequate methods of gas monitoring.

the President's Corner

news of the association

FOOD PROTECTION COMMITTEE — 1957 ACTIVITIES

A Subcommittee on Carcinogenesis was organized with Herbert E. Carter, Chairman, and the following members: Paul R. Cannon, Chicago University; C. J. Kensler, Boston University; J. A. Miller, University of Wisconsin; A. A. Nelson, FDA; Philippe Shubik, Chicago Medical School; and Morton L. Levin, New York State Health Department. The Subcommittee is directing its attention to two points: (a) the collection and correlation of information on organizations working in the field of dietary carcinogenesis, methods of evaluation, and governmental regulations concerning use of carcinogens in foods; and (b) the development of general principles for evaluation of the carcinogenic activity of food constituents and of the associated hazard for man. In addition to this long-range activity, the Subcommittee organized and conducted an orientation conference on carcinogenesis that was held in association with the annual meeting of the Liaison Panel, December 12.

The report of the Food Technology Subcommittee, "Food Packaging Materials — Their Composition and Uses," is nearing final drafting, and plans to revise "The Use of Chemical Additives in Food Processing" are developing.

Since publication of the FPC report, "The Safety of Polyoxyethylene Stearates for Use as Intentional Chemical Additives in Foods," a large body of data on the subject has accumulated. In view of this the Toxicology Subcommittee is re-examining the original conclusions to see whether they should now be modified.

The Pesticides Subcommittee prepared a list of chemicals used as insecticides, fungicides, herbicides, nematocides, plant-growth regulants, and molluscicides in production of food. The information was assembled at the request of the Subcommittee on Carcinogenesis for the information of that group.

Additional Activities of FPC. The Academy is required, under the provisions of Public Law 518, to select scientists to serve on advisory committees to consider petitions for pesticide tolerances when requested to do so by the Secretary of Health, Education, and Welfare. The Food Protection Committee has been delegated the job of recommending to the Academy scientists to be selected. An advisory committee to consider a petition for a tolerance of 0.25 p.p.m. of methoxychlor in milk was selected by this procedure. The committee, particularly the office staff, was also involved in selecting a panel of scientists to discuss scientific problems involved in testing and evaluating food additives for the House of Representatives Subcommittee on Health and Science. The Academy was requested by the chairman of the House Subcommittee to select the panel. Several members of the Food Protection Committee, its subcommittees, and Liaison Panel participated in the panel discussions. Dr. W. J. Darby, Chairman of FPC, was chairman of the panel.

Association of FPC with International Activities. The second session of the Joint FAO/WHO Expert Committee on Food Additives was held in Geneva, Switzerland, in June to consider procedures for testing food additives to establish their safety for use. Dr. R. B. Smith, Jr., Chairman of the Toxicology Subcommittee, and Dr. H. C. Spencer, member of the FPC Liaison Panel and former Chairman of the Industry Committee, were American members of the Expert Committee. Dr. Smith served as chairman of this session. Dr. Smith, Dr. Spencer, and Dr. Henry F. Smyth, Jr., a member of the Liaison Panel and of the Toxicology Subcommittee, prepared working papers for consideration of the committee.

In addition, FPC supplied, at the request of the secretariat for the Joint Expert Committee, a number of copies of FPC publications for use by the Committee in its deliberations. Dr. Darby served as chairman on the fifth Joint FAO/WHO Expert Committee on Nutrition which met in Rome in October. The Joint Committee considered, among other things, the over-all program of the two international agencies in the field of food additives.

W. F. GEDDES

A.A.C.C.

LOCAL SECTIONS

Pioneer Section, as its name implies, was a pioneer among the local sections of the AACC. It is to be congratulated on its 1958 publication of a booklet making its history, membership list, by-laws, and other information easily accessible to members and others who are interested.

"Early history," condensed from a sketch written in the early 1930's by Claude F. Davis, then chairman, tells of progress from the first formal step in 1922. "Current points of interest" carries the story along through the 30's, 40's, and down to the present time. Constitution and by-laws; rules governing check sample service; a list of trophies, sponsors, and winners; officers 1922–1957 and 1957 committees; and a complete membership list make the booklet both currently useful and valuable as a record for the future. The Booklet Committee – Homer Poe, Claude Neill, and Jeff Schlesinger, Chairman – may feel well repaid for their efforts.

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New York Section had its final meeting of the 1957–58 season on May 13 at The Brass Rail. Nat Nash, technical director of American Breddo Corporation, New York, spoke on "Functional factors in icings for baked sweet goods," illustrating with slides.

New officers for 1958-59: Otto G. Jensen, chairman; Elwood C. Edelmann, vice-chairman; William J. Simcox, secretary-treasurer.

• • • •

Niagara Frontier Section members, families, and friends were given a conducted tour of the Sir Adam Beck Hydroelectric Power Plant at Queenston Heights, Ontario (20 miles from Buffalo) on Saturday afternoon, May 17, through the courtesy of the Hydroelectric Power Commission of Ontario. To make it a picnic occasion, the near-by Niagara Glen Restaurant (operated by the Niagara Parks Commission) made a "dutch lunch" available from 10 a.m. on. Tables and a play area adjoining the restaurant, and an 18-hole golf course next door, helped total up the elements of an enjoyable day.

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Northern California Section's new officers as of June 1: Walter S. Hale, USDA, Albany, chairman; James C. Finley, Mill Valley, vice-chairman; Wesley M. Noble, Peerless Yeast, San Francisco, secretary; and William J. Stephens, San Francisco, treasurer.

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Canadian Prairie Section met on April 15 at Carling's Brewery, Winnipeg, to wind up the 1957–58 season. After a tour of the brewery and a buffet supper, E. J. Bass informed the members in regular meeting of some of the important matters discussed at the Section Officers' Luncheon in Cincinnati. Adjournment and the annual meeting followed. Officers elected for 1958–59 are: W. O. S. Meredith, chairman; M. H. Fisher, vice-chairman; and L. H. Rennie, secretary-treasurer.

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Pacific Northwest Section sends a baking report from eight laboratories testing Itana wheat. Average analysis on the 92% patent: protein, 11.5; ash, 0.350; absorption, 63.5; peak time, 6 minutes; M.T.I., 40. All labs reported baking quality good; better than the hard red winter varieties now being grown. Some called Itana a better variety than Columbia because of better-handling dough. Of the 8% clear, average protein was 14.5 and ash 0.690. It was considered to have good baking qualities when properly malted and bromated.

Anticipations of a successful meeting June 23 and 24 in Spokane were fully realized. Allied Trades sponsored a cocktail party preceding the banquet on the evening of June 24. Program and arrangements committees aimed for a fine balance between education and recreation, and bowling balls and golf clubs were included in the luggage of members. The ladies' entertainment was highlighted by a book review and an afternoon demonstration of Japanese flower arranging.

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Kansas City Section met on May 14 at the President Hotel, Kansas City. George Schiller of Pillsbury Mills, Enid, Okla., reviewed the paper by Frank W. Wichser, "Air-classified flour fractions," published in This Journal (May 1958 issue), and brought on an interesting discussion. Crop reporting committee appointed: Lawrence Iliff and Lawrence Warren.

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Cincinnati Section met on May 24 at the Fostoria Country Club, Fostoria, Ohio, as guests of the Mennel Milling Co., for a forenoon program followed by a business meeting. Ralph Lakamp of Kroger Food Foundation gave some details of the highly successful AACC convention, for which he was local arrangements chairman. From a background of many years' experience, Arlee Andre of Procter & Gamble discussed "Selecting the proper flour for a prepared mix." He stressed that anyone dealing with flours, whether housewife or cereal chemist, must learn to recognize symptoms which are clues to the problems. The cereal chemist has the important job of selecting flours which will as much as possible, prevent problems from reaching the consumer. Selection of flours is complicated by cost, availability, shipping and storage requirements of the packaged mix, and the "personalities" or behavior differences of flours meeting the same specifications.

Ross Milner and William Johnson led an active discussion on the problems of high-moisture (20%) wheat as they affect the farmer, buyer, and miller. Harvesting at 14% may mean lower yield, owing to loss of grain from shattering and storm damage. This loss can amount to a bushel per acre in 5 days or as the result of a single storm. It is estimated that the higher yield will more than pay the cost of drying the grain to the 14% level. Baking quality is not affected if drying temperatures do not exceed 160°F. The whole objective of this plan is to get the grain out of the field as early as possible and thus reduce losses. Farmers have shown interest when presented with the plan. About half of the country elevators have grain-drying equipment; more would be needed if it became general practive to harvest grain at 20% moisture. The program would be of particular help during bad harvest years. At the business meeting James Kelly (chairman), Frank Schwain, William Heald, and Ralph Lakamp volunteered to serve as an investigating committee.

David Downs, Krispy Kreme Corporation, who visited the Barcelona Fair in 1956, told how the Spanish people reacted to the American doughnut – and to other things; colored slides, including bullfight scenes, illustrated his talk.

A report of collaborative tests over 3½ years by the Cookie Test Committee is being prepared for publication.

Members voted a goodwill contribution of $100 to the Department of Flour and Feed Milling Industries, Kansas State College, for its Greater Milling Fund to restore facilities lost in last year's disastrous fire.

The fall meeting will again be held jointly with District 3, AOM, on Sept. 26 and 27 at Indianapolis. William Heald, Perie Pitts, and Al Bosley will work with AOM chairman Drake on arrangements.

New officers elected are: Clyde J. Steele, chairman; Lewis Baker, vice-chairman; W. T. Yamazaki, secretary-treasurer.

New members: R. C. Mason, Dearborn, Mich.; Arlee A. Andre, Procter & Gamble; Tod J. Stewart, Schulze and Burch Biscuit Co.; and Victor Tanilli, National Biscuit Co.

EMPLOYMENT NOTICES

BOOK reviews

The Story of Bread, by Ronald Sheppard and Edward Newton; 189 pp. Routledge and Kegan Paul, London, (1957). Price, 21s. Reviewed by DEREK D. LORD, Pepperidge Farm Inc., Norwalk, Conn.

This book surveys the progress of the bread baker in Britain from earliest times until the present day. Chapters 1 and 2 deal briefly with the discovery of panary fermentation over 4,000 years ago, and with bread in the early civilizations up to the Roman Empire. There is a good description of the bakers of Rome, which impresses one with their technical skill and knowledge. It is only in the last 150 years that significant improvements upon Roman methods have been made.

The next chapters outline the retail baker's progress from his emergence in the 12th century until his decline since World War II. The extent to which politics and government are concerned with ensuring an adequate supply of the relatively cheap food, bread, is emphasized to a degree that becomes tedious. The authors, editors of the *Bakers' Review*, periodical of the (British) National Association of Master Bakers, tend to become rather too partisan in presenting the case of the retail baker against the attacks of the wholesale baker on the one hand and government on the other.

Some of the nutritional aspects of bread are presented in the chapter, "Brown bread or white"; and some interesting customs and superstitions about bread, as well as the significance of bread in religion, are related.

A chapter contributed by John Scade describes variations to be found in the bread of Britain, most of which are produced by changes in the methods of molding, twisting, and cutting, or by baking on the hearth or in a pan, rather than by variations in formation. One major omission from this book: there are no typical formulas.

Modern bread bakery practice receives only the most scanty description, confined to approximately one page, with the briefest mention of mixers, dividers, and molders. In contrast, a complete chapter is devoted to the oven, describing its development from the primitive structure of ancient times to the gas-fired traveling oven. Another curious omission: lack of reference to fermentation beyond the simple statement that yeast generates carbon dioxide.

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Disease of Field Crops, by James G. Dickson, 2nd ed. McGraw Hill Book Co., Inc., New York, 1956, 517 pp. Price, $8.50. Reviewed by JAMES E. DEVAY, University of Minnesota.

This book has served as a major reference since the first edition appeared in 1947, and thus needs no introduction to plant scientists interested in diseases of cereals, grasses, legumes, and fiber plants. The arrangement of subject matter is the same as in the first edition; i.e., available information on the diseases of each crop is summarized and critically discussed in separate chapters. Emphasis is placed on characteristics useful for identifying various diseases as well as on control measures. Diseases which occur on several crop plants are discussed in detail under one crop only, and cross-reference is made to this discussion in other chapters. Further chapters have been added on diseases of the peanut and other legume plants.

The format of this edition is considerably improved over that of the first edition, in that illustrations have better contrast and the type is easier to read. Dr. Dickson's extensive experience and knowledge concerning diseases of field crops has been applied effectively in this critical summary of current information on the diseases covered. The book will be of most use as a reference, and will also have considerable value as a text in advanced courses in plant pathology. It is highly recommended to persons working in plant pathology and related fields.

How to Enjoy Work and Get More Fun Out of Life, by O. A. Battista; 229 pp. Prentice-Hall, Inc., Englewood Cliffs, N. J., 1957. Price, $4.95. Reviewed by HARRY G. OBERMEYER, General Mills Research Laboratories, Minneapolis.

Dr. Battista is a chemist, working for the American Viscose Corp. For a number of years, he has delighted all of us with his "Quotoons" appearing in scientific magazines and more recently in the newspapers. Now he has published this book, describing a system of organizing his activities so that he can cram more work, more satisfactions, and more variety into his life. He's so enthusiastic about it that he believes the system will work equally well for you. For one thing, he suggests avoiding what most people do wrong:

They eat too much.
They watch TV too much.
They can't make decisions.
They waste their energies in fits of temper.
They feel insecure about their wives or their work.
They let high taxes get them down.

One way to beat an emotional crisis is to do some hard work with your hands and get your mind off yourself. Another is to take a long, solitary walk and think things through. Getting sound, undisturbed sleep is most important. Find some time and place for a nap during the day. Keep your social activities at a pleasant level and don't let them get the upper hand. Live within your own reach — and like it! Keep your work load at your own best level. Coddle your body as you would a priceless machine — you cannot do more than your body can take. Tackle your important jobs when your mind is working best. Lubricate the egos around you, at home as well as on the job. Act so that

other people can like *themselves* (not necessarily you) better. Never block what your boss wants to do — back him up in any way you can. Show him that he can trust you and that you will always be courteous, dependable, punctual, polite, and appreciative of him. Dr. Battista may not have used the relaxed, balanced, and matured approach so well done three years ago by the late Dr. Schindler in *How to Live 365 Days a Year*, but he has provided a vigorous do-it-yourself kit for putting a little more zing in the old battery.

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Advances in Enzymology and Related Subjects of Biochemistry, vol. 19, with cumulative index of vols. 1 to 19, ed. by F. F. Nord; v+457 pp. Interscience: New York, 1957. Price $0.00. Reviewed by BYRON S. MILLER, U.S. Department of Agriculture, Manhattan, Kans.

The nineteenth volume in this important monograph series deals with five review articles of interest to chemists, biochemists, biologists, and medical research workers. Topics and authors are: Enzymatic aspects of photosynthesis—Wolf Vishniac, B. L. Horecker, and Severo Ochoa; Mechanisms of oxygen metabolism — H. S. Mason; Aktivierung von Aminosäuren — Theodor Wieland and Gerhard Pfleiderer; the properties of papain — J. R. Kimmel and Emil L. Smith; and Les voies principales de l'assimilation et dissimilation de l'azote chez les animaux — Alexandre E. Braunstein.

All of the chapters are well written, by experts in their field, and are documented thoroughly by both American and foreign literature citations. The chapter having the most interest to cereal chemists is the one entitled "The properties of papain." Topics covered in this chapter include the assay of papain; preparation of crystalline papain and mercuripapain; physical properties, composition of papain, activation and specificity of papain; other criteria of homogeneity; studies of amino acid sequence; kinetic studies; and a tentative reaction mechanism. The authors have drawn heavily on their own extensive research experiences, but have given thorough coverage to the abundant domestic and foreign literature dealing with papain. A total of 183 references are cited.

This monograph as well as the preceding volumes in the series provide a set of valuable if not indispensable references, particularly for those interested in enzymology. The entire series has very high standards and should be in every science library.

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Operations Research — a series of papers reprinted from **Research,** Vol. 9, 1956; Butterworth's Scientific Publications, London, 1956. Reviewed by D. D. RIPPE, General Mills, Inc., Minneapolis, Minn.

This pamphlet contains the following six papers: Organization of Operational Research — S. Beer; Science Statistics and Operations Research — N. T. J. Bailey; Linear Programming — F. H. Hahn; Operational Research on Queueing Problems — R. S. Gander; Probability and Operational Research — F. Benson; Work Sampling Applied to Operations Research — L. H. C. Tippett.

Presumably the papers were assembled in order to convey to executives and scientists who may be in a position to utilize operations research some concept as to its nature. To this end, the first two papers are rather general in nature and the last four are specific references to operations research tools that are available.

The first paper makes interesting general reading for any scientist. Beer explains the general method of operations research with an analogy to the "uncertainty principle enunciated by Heisenberg." He discusses a proper organization of operations research in an enterprise, by an analogy to ecology which "deals with this interaction between an organism and its environment."

The papers in general are not detailed enough to provide tools for the operations research specialist and are perhaps too technical for the nonspecialist. The last paper does, however, point out a general area of interaction between operations research and industrial engineering which it is desirable to emphasize.

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Introduction to Protein Chemistry, by Sidney W. Fox and Joseph F. Foster. John Wiley & Sons, Inc., New York, 1957; 440 pp. plus index. Price, $9.50. Reviewed by D. B. PRATT, JR., Pillsbury Mills, Inc., Minneapolis.

The authors have presented the elements of protein chemistry in textbook fashion, designed to introduce the organic chemist to the specialized area of protein. The authors first define the scope of protein chemistry, then develop their subject through a very thorough coverage of amino acids — chemical and physical characteristics, synthesis, assay, and nutritional significance. With this basic background the student is then introduced to the peptides and finally the proteins. As each plateau in building the protein is achieved, the text covers the various properties of each group, leading finally to discussions of various protein systems, pointing out the relationships of the basic knowledge to such specialized fields as biology, food technology, and nutrition.

Since the work has been designed as a text, the authors have included in each section a rather complete bibliography of references. These references serve the two-fold purpose of identifying source material and as a means of expanding the information covered in the basic text. This is an especially valuable addition for those readers who will use the volume as a reference work.

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Essentials of Nutrition, by Henry C. Sherman and Caroline Sherman Lanford; 4th ed., 505 pp. The Macmillan Co., New York, 1957. Price, $4.90. Reviewed by P. E. RAMSTAD, General Mills, Inc., Minneapolis, Minn.

This latest edition of one of the best-known textbooks in the field of human nutrition follows the form that characterized previous editions. Changes are chiefly those necessary to present up-to-date information in a rapidly changing and developing field.

While designed as a text for use in a general nutrition course, it will also serve as a useful reference in many laboratories and offices where nutritional information is frequently needed but where the expense of purchasing many more specialized references may not be justified.

In addition to discussing biochemical and physiological aspects of nutrition, the authors include information on food composition, food economics in terms of nutrition, recommended dietary allowances, and a glossary of nutrition terms. The reader will gain an appreciation of

the philosophy behind present-day thinking and investigation in the field of human nutrition. We are in an era in which improvement of life is sought "(1) correctively, in the cure and prevention of deficiency diseases and of the less well-recognized states of nutritional shortage or subnormality, and (2) constructively, in the improvement of already-normal health." The difference between *minimum requirements* for a nutrient and *recommended allowances* is emphasized in this regard.

This book provides a historical background on most of the topics discussed. The work of many agencies concerned with human nutrition — e.g., The Nutrition Foundation, Food and Nutrition Board of the National Research Council, World Health Organization, medical associations, and various governmental departments — is described.

Each chapter is followed by a set of exercises designed as teaching aids and by a list of suggested readings which include review papers and recent original research papers, thus facilitating the process of further developing knowledge and understanding of the subjects covered.

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Topics in Microbial Chemistry, ed. by F. M. Strong; 166 pp. John Wiley & Sons, Inc., New York, 1958. Price $5.00. Reviewed by ROBERT B. KOCH, Broadview, Illinois.

The annual E. R. Squibb Lectures at the Institute of Microbiology, Rutgers University, were given in 1956 by F. M. Strong of the University of Wisconsin. His presentations have been combined and make up the contents of this book. The purpose of the Squibb Lectures and of this book is to illustrate the contributions of microbial chemistry to general biochemistry. Although the book is specific in interest, it fulfills its purpose with illustrations of direct contributions of knowledge to understanding specific biochemical functions. It also fulfills its purpose by pointing out the action of certain chemical compounds whose biochemical functions are yet unknown.

"Antimycin" — an antibiotic for fungi, "Coenzyme A" — required for fat oxidation, and "Kinetin and Kinins" — plant growth hormones — are the subjects of the three chapters in the book. The unifying theme is that the chemical identity of these substances is the principal topic of each chapter. Studies on these three compounds followed the usual procedure employed for identification of unknown substances, i.e., discovery and isolation, production, purification, separation into individual components, and structural determination. A brief discussion of biological properties and mechanisms of action, where known, is also presented.

Investigations of the antibiotic properties of antimycin have shown it to be a potent inhibitor of the hydrogen transport system. This compound is an almost indispensable reagent for the enzymologist interested in the electron transport system in metabolism.

A brief history of the discovery and isolation of pantothenic acid is presented as a part of the chapter dealing with the identification of coenzyme A. Interest in pantothenic acid, which was found to be an intricate part of coenzyme A, arose from the growth factor studies of the lactic bacteria.

Kinetin, a plant growth hormone obtained by heating DNA, was discovered as a result of research on the plant growth hormones from coconut milk. A description of the degradation and analytical studies which gave indications of the components present in kinetin and led to its synthesis from pure compounds is clearly presented. This is true for each of the compounds discussed in the three chapters. Material presented is mainly that of the author and his associates at the University of Wisconsin, gathered over a number of years. It provides an excellent example, presented in a clear and concise manner, of the different procedures followed in identification of unknown chemical compounds. It also illustrates the difficulties encountered, the time and effort required, and some of the unique techniques that can be applied in the purification and determination of chemical and physical properties of unknown substances.

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The Chemistry and Biology of Yeasts, ed. by A. H. Cook; xii + 763 pp. Academic Press, Inc., New York, 1958. Price, $22.00. Reviewed by HENRY J. PEPPLER, Red Star Yeast and Products Co.

When a compendium devoted to a special area is authored by sixteen scientists of international fame, an outstanding presentation is anticipated. This book exceeds expectations.

It is a distinguished effort which encompasses in one volume an integrated, up-to-date source of information on significant developments in biological and chemical research on all types of yeasts. Each contributor has dutifully provided a concise reflection of the pioneer studies, and then given comprehensive treatment to recent investigations through 1956. Researchers and students alike, in academic and applied pursuits, will welcome this major work of reference and interpretation.

Biology dominates the opening chapters. The history of yeast taxonomy by Lodder, Slooff, and Kregervan Rij is followed by their crisp discussions of the characteristics of the genera and the more important species of ascosporogenous, ballistosporogenous, and asporogenous yeasts. Lund's synopsis on ecology benefits by the ensuing consideration of the life history of yeasts by Winge and Roberts, who also collaborated on the excellent review of yeast genetics.

Chemical aspects of yeast metabolism are reviewed in the middle five chapters, comprising more than one-half of the text. Eddy's comprehensive treatment of yeast composition, Morris on yeast growth, Nord and Weiss on fermentation and respiration, Trevelyan's carbohydrate metabolism, and nitrogen metabolism by Harris are outstanding contributions.

The final four chapters are devoted to short but adequate coverage of applied yeastology. Pathogenic yeasts are discussed by Ainsworth — the shortest chapter in the book. Pyke reviews yeast technology all too briefly, owing to unfamiliarity with industry in the United States of America. The occurrence of yeasts in food spoilage is reported by Ingram. The final chapter by Jansen expertly considers the problem of yeast flocculation as applied to practical brewing.

Typical of well-written and conscientiously edited books, *The Chemistry and Biology of Yeasts* is *sans tache*. For a work of this scope the proofreading has been extraordinary — missing only a handful of misspelled words.

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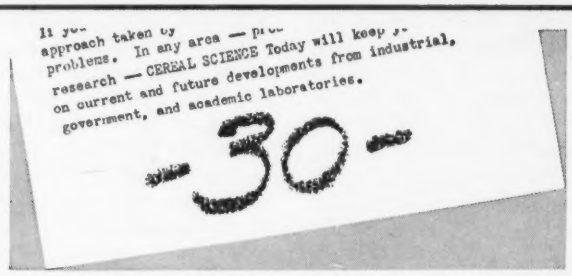
Food Facts Talk Book is the title of a new booklet prepared to help combat food misinformation. In it many popular fallacies are refuted in an authoritative, easily understood manner. Copies are available at 50 cents each from the American Dietetic Association, 620 N. Michigan Ave., Chicago 11, Ill.



AACC HONORARY MEMBERS

April 10, 1958

Dr. William B. Bradley
President, A.A.C.C.
My dear Bradley,

I have just received your telegram informing me of election to honorary membership in the A.A.C.C.

This is a great honor, and I am very happy over being so chosen.

The A.A.C.C. has had great influence upon me during my entire business life. It has brought great leadership to its members and furnished knowledge and guidance which has spurred us all to further efforts.

My greatest regret is being unable to travel and attend the meetings.

I extend to you and the Association membership my heartfelt thanks and best wishes.

Yours truly,
John C. Baker

11 April 1958

Dr. William B. Bradley,
American Institute of Baking,
Dear Dr. Bradley;—

Your telegram advising me of my election as an honorary member of the American Association of Cereal Chemists reached me yesterday, and I hastened to wire you expressing my appreciation of this distinction. I greatly enjoyed, and profited from my various relations to the A.A.C.C., as you can well appreciate from your own experiences. And I derived added satisfaction from receiving such a message from a highly respected colleague and good personal friend.

The years that I spent in the field of cereal chemistry and technology were most pleasant and satisfying, and particularly because of the many competent colleagues with whom I was associated. In fact, I have regretted in recent times that the pressure of administrative responsibilities kept me from continuing such activities to the same degree.

Very truly yours,
C. H. Bailey

ZELENY GETS AWARD

Our ex-president, Dr. Lawrence Zeleny, AMS at Beltsville, has been awarded the Superior Service Award by the U.S. Department of Agriculture. The award was made for his unusual effectiveness in conducting investigations pertaining to United States standards and Federal specifications for grain and other commodities and for notable authorship in the field of cereal science.

ANNOUNCEMENT

The American Association of Cereal Chemists is holding three insect fragment, rodent hair, and X-ray training schools in San Francisco (Sept. 15-20), New York (Jan. 12-17), and Chicago (mid-April, 1959). These schools are open to all qualified interested scientific personnel. The U. S. Food and Drug Administration is cooperating by providing instructors for each school. REGISTRATION FOR SAN FRANCISCO CLOSES AUGUST 22. Apply to: M. C. Midgley, Albers Milling Co., 2700 7th St., Oakland 7, Calif. AACC members will be given further details and application blank about the first of July.